FACT SHEET

NEW SOUTH WALES MINERALS COUNCIL LTD
MININGENUITY™

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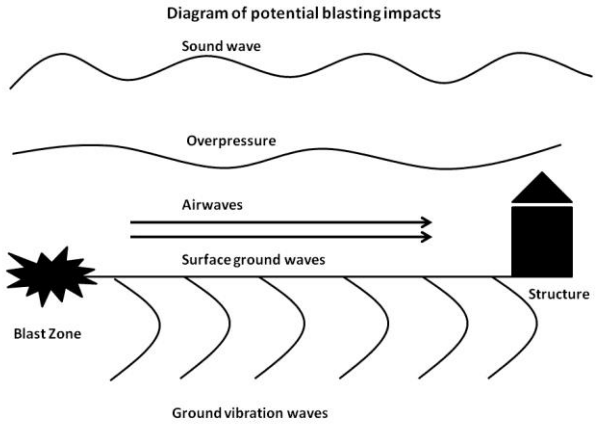
Blasting and the NSW Minerals Industry

Blasting is an integral part of mining operations. The community may experience some impacts from blasting as a result of mining activities. This fact sheet explains potential impacts, how these activities are regulated and how they can be managed.

What are blasting impacts?

There are two main impacts from blasting – *overpressure* and *ground vibration*. Noise and dust impacts also relate to blasting activities, however, these are addressed in separate fact sheets, available at www.nswmin.com.au. Blasting is extensively used in mining operations, both in surface and underground mining. The blasting process uses explosives to fracture the rock, which enables mining to take place. This process releases energy that causes *overpressure* and *ground vibration*. Blasting can contribute to minor localised seismic activity from the resulting ground movement.



Ground vibration is transmitted through the ground that surrounds the blast as a series of waves and can rapidly travel significant distances, gradually reducing in amplitude over distance. It arrives before the impact of *overpressure* as it travels quicker through the ground.

Overpressure travels as an airwave and is able to cause a vibration response in structures such as buildings. *Overpressure* is dominated by low frequencies that are sometimes inaudible but can be felt. It is possible that a blast may be felt, due to the *ground vibration* and *overpressure*, although it is not heard.

Because *overpressure* travels through the atmosphere, certain meteorological conditions such as temperature, cloud cover, wind speed and direction can affect its intensity some distance from the blast site, depending on local conditions. Weather conditions are typically monitored before a blast to make sure conditions are suitable for blasting and to minimise impacts.

How are blasting impacts measured?

Both *overpressure* and *ground vibration* can be measured and are regularly monitored as part of blasting operations. *Overpressure* is measured using a *Sound Level Meter*, which measures the change in pressure associated with the pressure wave. A *Blast Monitor* measures the *ground vibration* by measuring the movement of particles by the vibration waves in three dimensions. Measurement enables the impacts of blasting to be accurately recorded and analysed to assess compliance with statutory criteria and enable improvements in blasting practices.

How is blasting regulated?

The NSW Government has policies and regulations which balance the need for our society's industrial activity while mitigating blasting impacts on the local community. These regulations help the industry to apply best practices and encourage practical and effective solutions. Mining operations provide annual reports demonstrating monitoring and compliance with requirements including:

- Australian and New Zealand Environment Council (ANZEC), *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*
- Department of Environment, Climate Change & Water (DECCW), *Assessing Vibration: a technical guideline*
- *Environmental Planning and Assessment Act 1979*, administered by Department of Planning (DoP)
- *Mining Act 1992*, administered by Industry & Investment NSW (I&I NSW)
- *Protection of the Environment Operations Act 1997*, administered by DECCW.

What are the typical criteria for blasting impacts?

Two types of criteria are set to maintain comfort levels within the community. Typical amenity level criteria are outlined below, though these may vary across operations:

- *Ground Vibration* - 5mm/sec with 5% allowable to 10mm/sec or less in an annual period
- *Overpressure* - 115dB(Lin Peak) with 5% allowable to 120 dB(Lin Peak) or less in an annual period.

The exceedance level criteria are based on potential damage limits identified through research studies.

Can blasting impacts cause damage to my house?

Ground vibration and *overpressure* at high levels have the potential to cause structural damage. Mines in NSW operate well below levels known to cause damage and are designed to minimise the likelihood of any type of structural damage occurring from blasting.

When *ground vibration* and *overpressure* arrive at a structure near a blast, various impacts may occur such as shaking of the walls, windows, and gentle rattling or displacement of loose objects on shelves. Effects from *overpressure* and vibration are often greater inside a structure than outside and, if unexpected, can be quite startling.

Many natural phenomenons have a similar impact on structures, such as southerly or strong gusts of wind. For example, a breeze of 18km per hour, is sufficient to produce a pressure difference of 115dBL, whilst a wind of 40km per hour can produce 130dBL which is more than the limits set for blasting. Human activities within houses also induce a vibration in the structure on a daily basis eg. closing a door in a house produces a vibration level of 1mm per sec. Slamming a door can produce a vibration level of 12mm per sec at the other end of the house and walking on wooden floors creates approximately 3mm per sec vibration. Structures can also be affected by the natural movement of the ground beneath them. In response to climatic conditions, soils expand and contract, which also affect the structures in which we live and work.

The levels of vibration and *overpressure* typically experienced at residences from blasting rarely reach the levels that would result in cosmetic or structural damage. Structural property inspections are typically available to residents under the mining development consent conditions within a 2km distance of mining operations in rural areas.

How does the mining industry manage blasting impacts?

The mining industry has been very proactive in developing methods to minimise blasting impacts. Some of these methods include:

- Restricted blasting times (typically between the hours of 9am-5pm)
- Blast design including direction and detonation and designing the detonation sequence with delays between holes so that the blast waves from individual holes do not arrive simultaneously at a residence
- Avoiding blasting during adverse weather conditions
- Orientation of the blast face and directing energy away from sensitive sites
- *Maximum Instantaneous Charge*
- Dimensions of the blast – spacing between holes, distance from the free face to the first row of holes (called the burden), distance between rows of holes (also called the burden)
- Type and depth of stemming.

Typically these are documented in Blast Management Plans which include a monitoring program and are reported to governments as required.

Consultation with neighbours

Consultation with residents is encouraged and, in many cases in NSW, is a regulatory requirement. Monitoring near closest homes, prior advice of the timing of blasts and information sharing are good practices that occur at many operations.

Glossary of Terms

Blast Monitor: an instrument that measures seismic waves along three mutually perpendicular axes (x, y, z) to determine Peak Particle Velocity.
Decibel (dB): a unit of sound measurement which quantifies pressure fluctuations associated with noise and overpressure.
dB (Lin Peak): decibel associated with the maximum excess pressure in the overpressure wave. Lin represents linear - indicating that no weighting or adjustment is made to the measurement.
Ground Vibration: motion of the ground caused by the passage of seismic waves originating from a blast. The rate of the ground vibration movement is called Peak Particle Velocity (PPV) and is measured in millimetres per second (mm/sec).
Maximum Instantaneous Charge (MIC): maximum amount of explosive detonated per delay.
Overpressure: a pressure wave in the atmosphere which is caused by the detonation of explosives. Overpressure consists of both an audible (noise) and inaudible energy is measured in dB (Lin Peak).
Sound Level Meter: an instrument that measures sound pressure levels in *decibels*.
Stemming: inert material used to maximise the effect of an explosion by filling the remainder of hole after they have been charged with explosives.

References and more information:

- ACARP (2002), *Study C9040 Structure Response to Blast Vibration:* www.acarp.com.au/abstracts.aspx?repId=C9040
- Australian and New Zealand Environment Council (ANZEC) (1990), *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration*
- Standards Australia (1993), *Explosives - Storage, transport and use*: www.standards.com.au
- Department of Environment, Climate Change & Water (DECCW), *Assessing Vibration: a technical guideline*: www.environment.nsw.gov.au
- DECCW, Environment Protection Licence: www.environment.nsw.gov.au
- Department of Planning, Notice of Determination: www.planning.nsw.gov.au
- *Protection of the Environment Operations Act (POEO Act)*: www.legislation.nsw.gov.au